CLAIMS

1. A luminous body with a prolonged fluorescence lifetime, characterized by comprising an activator and further at least one coactivator selected from the group consisting of lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), lutetium (Lu), bismuth (Bi), tin (Sn), antimony (Sb) and analogues thereof as an additional luminescent center for enhancing the thermostability of luminous body.

2. The luminous body with a prolonged fluorescence lifetime according to claim 1, characterized in that said luminous body comprises silicate-germanate and is doped with europium to improve its thermostability, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$$M'_aM''_b(Si_{1-z}Ge_z)_c(Al,Ga,In)_d(Sb,V,Nb,Ta)_eO_{(a+b+2c+3d/2+5e/2-n/2)}X_n:Eu_x,R_y$$

wherein

M' represents one or more elements selected from the group consisting of calcium (Ca), strontium (Sr), barium (Ba), and zinc (Zn);

M" represents one or more elements selected from the group consisting of magnesium (Mg), cadmium (Cd), manganese (Mn), and beryllium (Be);

R represents one or more elements selected from the group

consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

X represents an ion selected from the group consisting of fluorine (F), chlorine (Cl), and bromine (Br) to balance the charge;

and

$0.5 \leq a \leq 8$,

$0 \leq b \leq 5$,

$0 < c \leq 10$,

$0 \leq d \leq 2$,

$0 \leq e \leq 2$,

$0 \leq n \leq 4$,

$0 \leq x \leq 0.5$,

$0 \leq y \leq 0.5$, and

$0 \leq z \leq 1$.

3. The luminous body with a prolonged fluorescence lifetime according to claim 1, characterized in that said luminous body comprises aluminate-gallate and is doped with europium to improve its thermostability, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$$M'_4(Al,Ga)_{14}(Si,Ge)_pO_{25+2p}:Eu_x,R_y$$

wherein

M' represents one or more elements selected from the group consisting of Sr, Ba, Ca, Mg, and Zn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb,

Lu, Bi, Sn, and Sb;

and

$0 < p \leq 1$, or

the empirical formula

$$M''(Al,Ga)_2(Si,Ge)_pO_{4+2p}:Eu_x,R_y$$

wherein

M" represents one or more elements selected from the group consisting of Sr, Ba, Ca, Mg, and Zn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

and

$0 < p \leq 1$,

$0 \leq x \leq 0.5$, and

$0 \leq y \leq 0.5$.

4. The luminous body with a prolonged fluorescence lifetime according to claim 1, characterized in that said luminous body comprises aluminate and is doped with europium to improve its thermostability, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$$(M',M'',M''')M'''_2Al_{16}O_{27}:Eu_x,R_y$$

wherein

M' represents one or more elements selected from the group consisting of Ba, Sr, and Ca;

M" represents one or more elements selected from the group consisting of lithium (Li), sodium (Na), potassium (K),

and rubidium (Rb);

M'" represents Dy;

M"" represents Mg or Mn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

$0 < x \leq 0.5$, and

$0 \leq y \leq 0.5$.

5. The luminous body with a prolonged fluorescence lifetime according to claim 1, characterized in that said luminous body comprises alkaline earth metal aluminate-gallate and is doped with europium to improve its thermostability, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$$M'_{1-a}(Al,Ga)_b(Si,Ge)_cO_{1.5b+1+3c/2}:Eu_x,R_y$$

wherein

M' represents one or more elements selected from the group consisting of Ca, Sr, Ba, and Mg;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

and

$0 \leq a \leq 1$,

$0 \leq b \leq 10$,

$0 \leq c \leq 8$,

$0 \leq x \leq 0.5$, and

$0 \leq y \leq 0.5$.

6. The luminous body with a prolonged fluorescence lifetime according to any one of claims 1 to 5, characterized in that said luminous body is in the form of a single type or a mixture of two or more types.

7. The luminous body with a prolonged fluorescence lifetime according to any one of claims 1 to 6, characterized in that said luminous body is used as a luminous layer in the preparation of LED.

8. The luminous body with a prolonged fluorescence lifetime according to any one of claims 1 to 7, characterized in that said luminous body is used in a layer which emits light ranging from colored light to white light in LED.

9. The luminous body with a prolonged fluorescence lifetime according to any one of claims 1 to 8, characterized in that said luminous body is used in LED which, upon switch-off of excitation energy of a luminous layer, causes a color change in emission of a radiation.

10. The luminous body with a prolonged fluorescence lifetime according to any one of claims 1 to 6, characterized in that said luminous body is in the form of a single type or a mixture of two or more types and is used in the preparation of a luminous layer of a compact energy saving lamp.

11. An optical device comprising a wavelength converting part comprising a luminous body which emits light upon excitation based on light emitted from an LED element,

characterized in that said wavelength converting part comprises a luminous body comprising an activator and further at least one coactivator selected from the group consisting of lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), lutetium (Lu), bismuth (Bi), tin (Sn), antimony (Sb) and analogues thereof as an additional luminescent center for enhancing the thermostability.

12. An optical device characterized by comprising:

an LED element;

a power feeding part for mounting said LED element thereon and feeding power to said LED element;

a light transparent sealing part for sealing said LED element and said power feeding part integrally with each other; and

a wavelength converting part for emitting light upon excitation based on light emitted from said LED element, said wavelength converting part comprising a luminous body comprising an activator and further at least one coactivator selected from the group consisting of lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), lutetium (Lu),

bismuth (Bi), tin (Sn), antimony (Sb) and analogues thereof as an additional luminescent center for enhancing the thermostability.

13. An optical device characterized by comprising:

an LED lamp;

a light guiding part for guiding light emitted from said LED lamp;

a wavelength converting part for emitting light upon excitation based on light guided through said light guiding part, said wavelength converting part comprising a luminous body comprising an activator and further at least one coactivator selected from the group consisting of lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd), samarium (Sm), gadolinium (Gd), terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), lutetium (Lu), bismuth (Bi), tin (Sn), antimony (Sb) and analogues thereof as an additional luminescent center for enhancing the thermostability; and

a lighting part for lighting based on light emitting through said wavelength converting part.

14. The optical device according to any one of claims 11 to 13, characterized in that said wavelength converting part comprises a luminous body that comprises silicate-germanate and is doped with europium, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$$M'_aM''_b(Si_{1-z}Ge_z)_c(Al,Ga,In)_d(Sb,V,Nb,Ta)_eO_{(a+b+2c+3d/2+5e/2-}$$

$_{n/2)}X_n:Eu_x,R_y$

wherein

M′ represents one or more elements selected from the group consisting of calcium (Ca), strontium (Sr), barium (Ba), and zinc (Zn);

M″ represents one or more elements selected from the group consisting of magnesium (Mg), cadmium (Cd), manganese (Mn), and beryllium (Be);

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

X represents an ion selected from the group consisting of fluorine (F), chlorine (Cl), and bromine (Br) to balance the charge, and

$0.5 \leq a \leq 8$,

$0 \leq b \leq 5$,

$0 < c \leq 10$,

$0 \leq d \leq 2$,

$0 \leq e \leq 2$,

$0 \leq n \leq 4$,

$0 \leq x \leq 0.5$,

$0 \leq y \leq 0.5$, and

$0 \leq z \leq 1$.

15. The optical device according to any one of claims 11 to 13, characterized in that said wavelength converting part comprises a luminous body that comprises aluminate-gallate and is doped with europium, wherein the luminous body comprises an

additional dopant and corresponds to the empirical formula:

$$M'_4(Al,Ga)_{14}(Si,Ge)_pO_{25+2p}:Eu_x,R_y$$

wherein

M' represents one or more elements selected from the group consisting of Sr, Ba, Ca, Mg, and Zn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

and

$0 < p \leq 1$, or

the empirical formula

$$M''(Al,Ga)_2(Si,Ge)_pO_{4+2p}:Eu_x,R_y$$

wherein

M" represents one or more elements selected from the group consisting of Sr, Ba, Ca, Mg, and Zn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

and

$0 < p \leq 1$,

$0 \leq x \leq 0.5$, and

$0 \leq y \leq 0.5$.

16. The optical device according to any one of claims 11 to 13, characterized in that said wavelength converting part comprises a luminous body that comprises aluminate and is doped with europium, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$(M',M'',M''')M''''_2Al_{16}O_{27}:Eu_x,R_y$

wherein

M' represents one or more elements selected from the group consisting of Ba, Sr, and Ca;

M'' represents one or more elements selected from the group consisting of lithium (Li), sodium (Na), potassium (K), and rubidium (Rb);

M''' represents Dy;

M'''' represents Mg or Mn;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

$0 < x \leq 0.5$, and

$0 \leq y \leq 0.5$.

17. The optical device according to any one of claims 11 to 13, characterized in that said wavelength converting part comprises a luminous body that comprises alkaline earth metal aluminate-gallate and is doped with europium, wherein the luminous body comprises an additional dopant and corresponds to the empirical formula:

$M'_{1-a}(Al,Ga)_b(Si,Ge)_cO_{1.5b+1+3c/2}:Eu_x,R_y$

wherein

M' represents one or more elements selected from the group consisting of Ca, Sr, Ba, and Mg;

R represents one or more elements selected from the group consisting of La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Bi, Sn, and Sb;

and

$0 \leq a \leq 1$,

$0 \leq b \leq 10$,

$0 \leq c \leq 8$,

$0 \leq x \leq 0.5$, and

$0 \leq y \leq 0.5$.

18. The optical device according to claim 12, characterized in that said wavelength converting part is included in said light transparent sealing resin for sealing said LED element.

19. The optical device according to claim 12, characterized in that said luminous body is a thin-film luminous body layer that is sealed with said light transparent glass.

20. The optical device according to claim 19, characterized in that said luminous body layer is planar.

21. The optical device according to claim 12, characterized in that said wavelength converting part is provided on a surface of the sealing resin having an optical shape that radiates light emitted from said LED element in a desired lighting area.

22. The optical device according to any one of claims 11

to 13, characterized in that said wavelength converting part is excited upon exposure to blue light and/or ultraviolet light with wavelengths ranging from 300 nm to 500 nm.